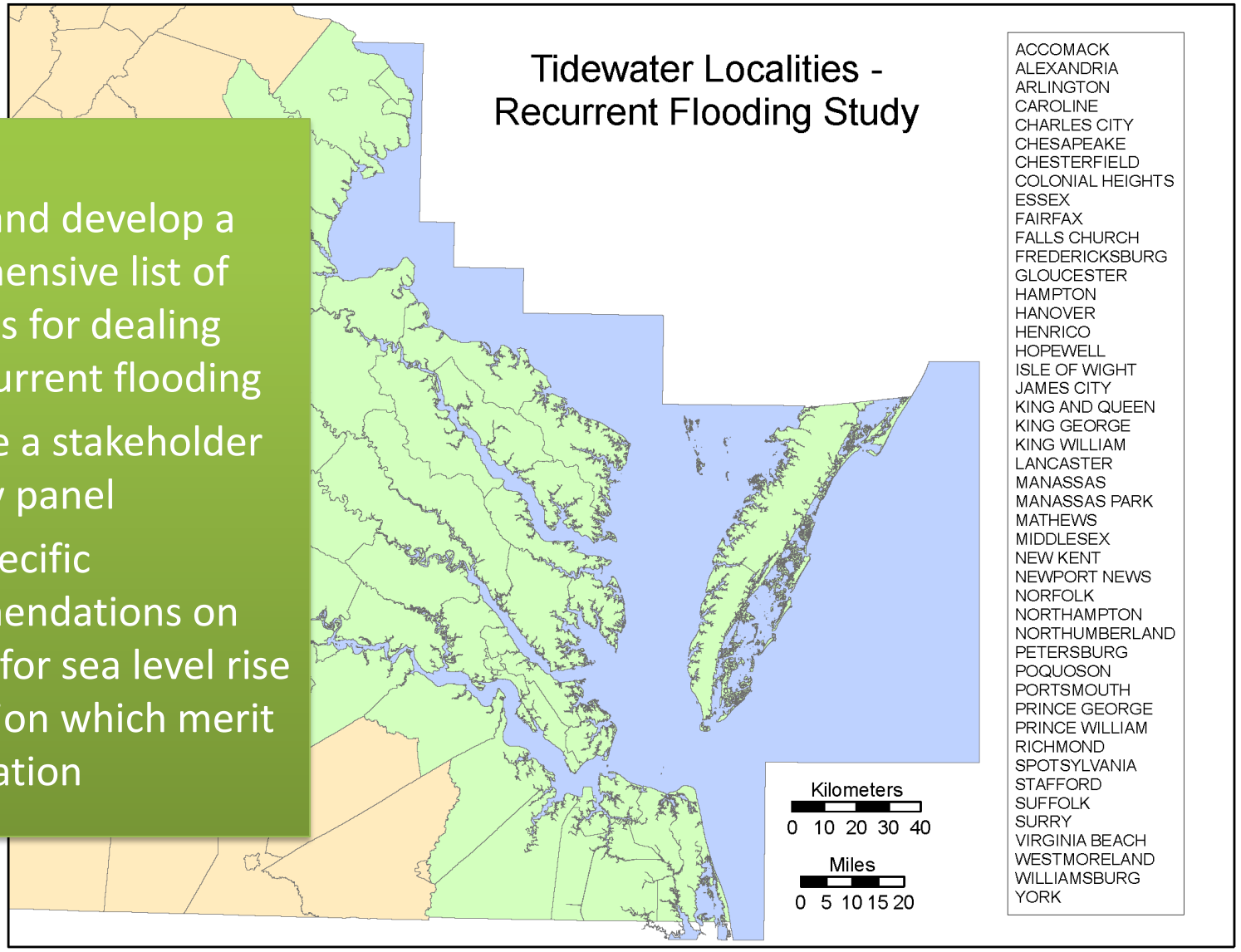
Recurrent Coastal Flooding: Planning to Adapt

Center for Coastal Resources Management
Virginia Institute of Marine Science

VIMS | William & Mary
Virginia Institute of Marine Science

Recurrent Flooding Study

- Goals
  - Review and develop a comprehensive list of strategies for dealing with recurrent flooding
  - Convene a stakeholder advisory panel
  - Offer specific recommendations on options for sea level rise adaptation which merit investigation



Collaborators: VIMS, ODU, HRPDC, City of Norfolk, A-NPDC, Wetland Watch

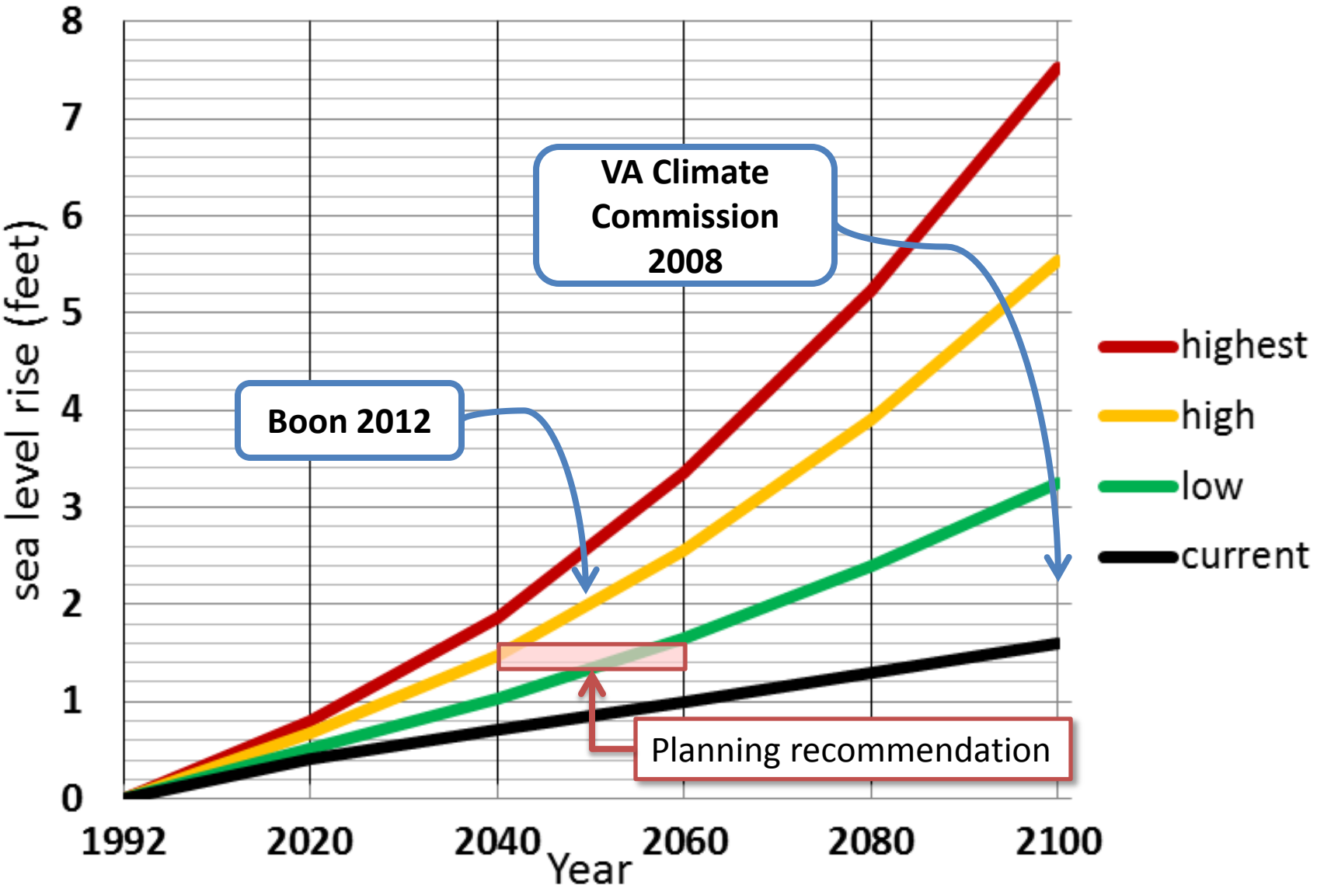
Causes of Flooding

- Precipitation based flooding
  - Issue throughout Virginia
- Tidal and storm surge flooding
  - Issue in tidal areas


Photo by Liz Roll/FEMA


Flooding in Franklin, VA
Photographer: Liz Roll/FEMA

SE Virginia sea level rise scenarios



Elevated house in Mississippi
Photo by Robert Harris/*FEMA*

Adaptation Strategies

Management/ Retreat

Accommodation

Protection

Vulnerability

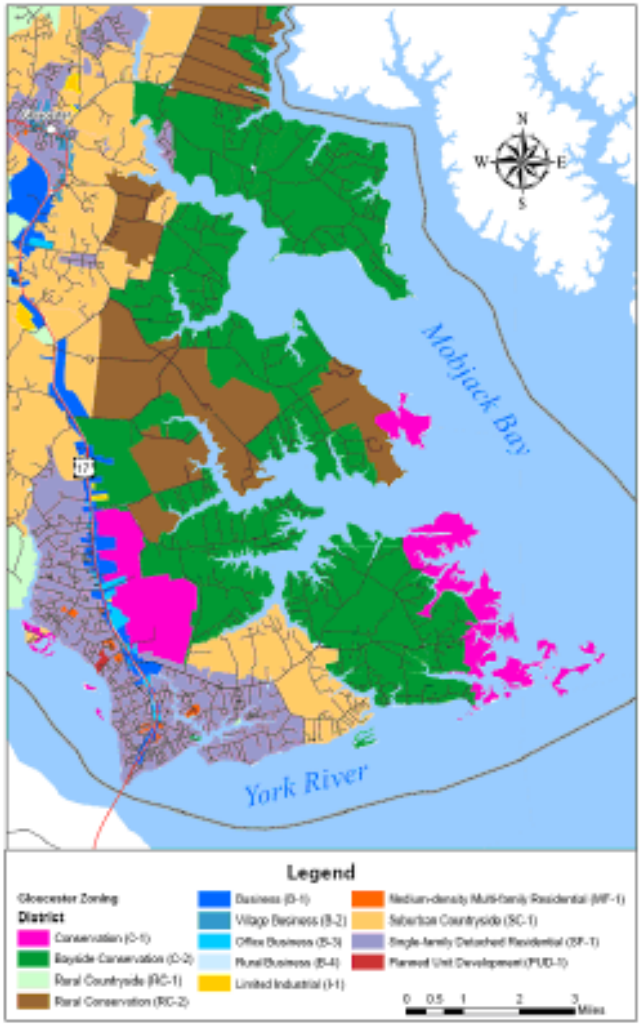
Levee in North Dakota
Photo by Andrea Booher/FEMA

Controllable: Methods to reduce vulnerability to flooding.

ADAPTATION STRATEGIES

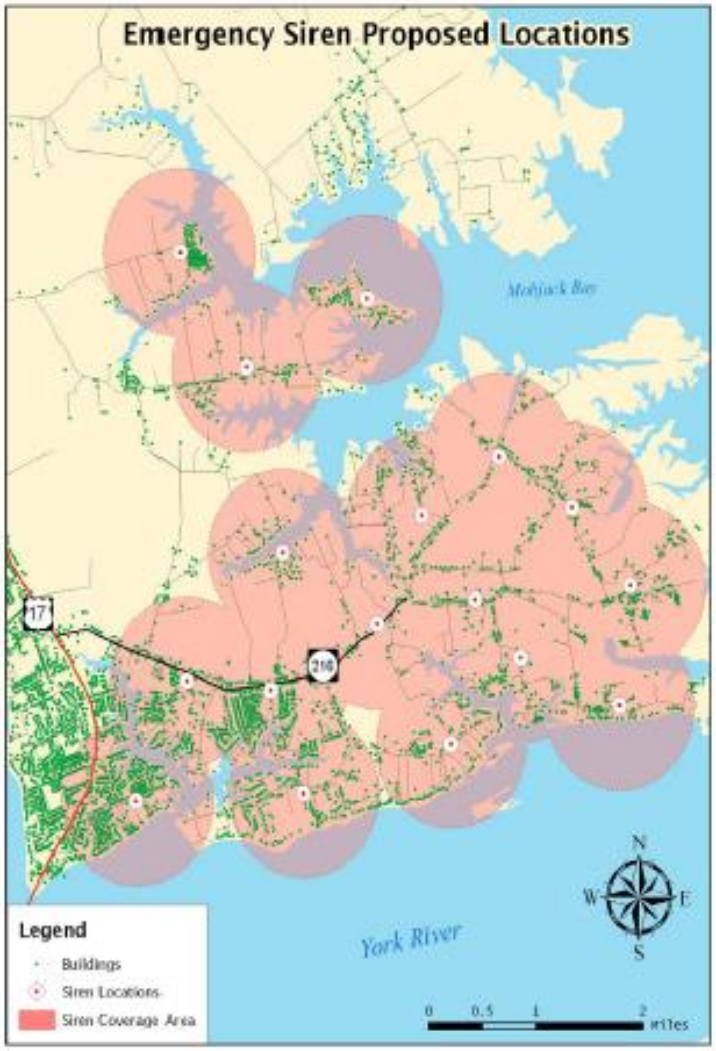
Management

Gloucester County Zoning (Southeastern Portion Inset)

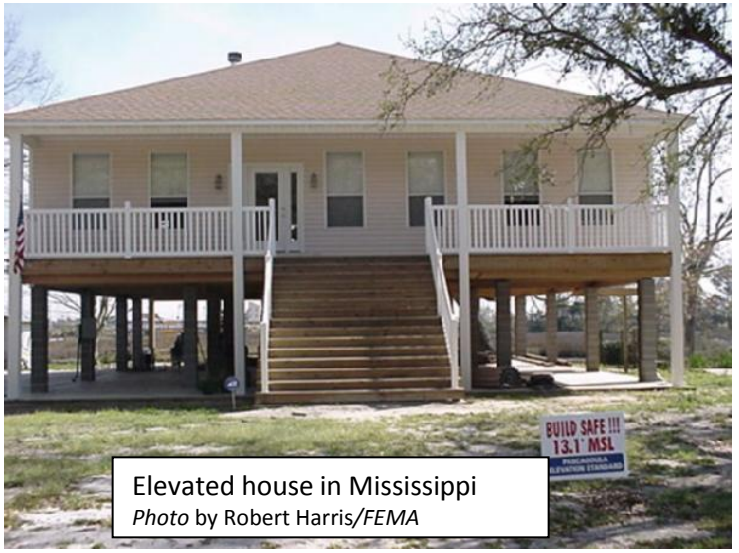


Source: County Base GIS layers were provided by United States Census Bureau and the County Zoning GIS layers were provided by Gloucester County Information Technology/ GIS Department.

Accommodation



Source: County Base GIS layers were provided by United States Census Bureau and the County Addressed Building GIS layer was provided by Gloucester County Information Technology/ GIS Department.



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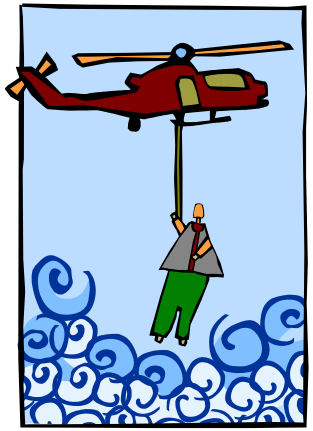
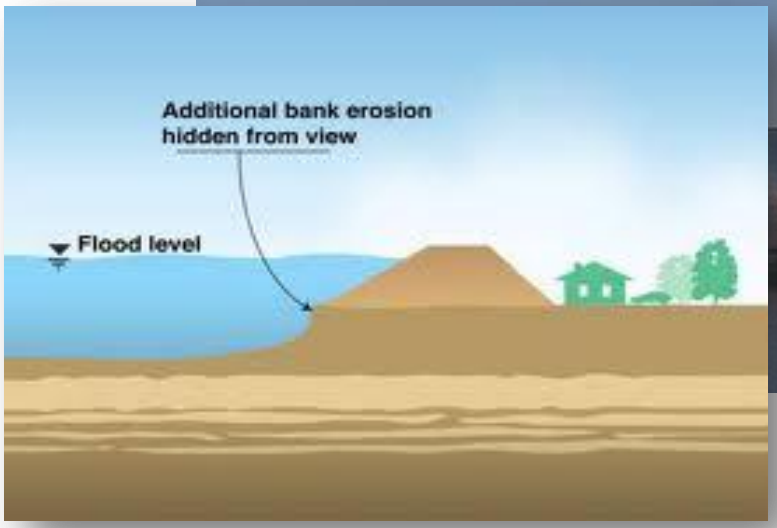


VIMS Eastern Shore Seawater Lab

FEMA Zone VE (Coastal High Hazard)

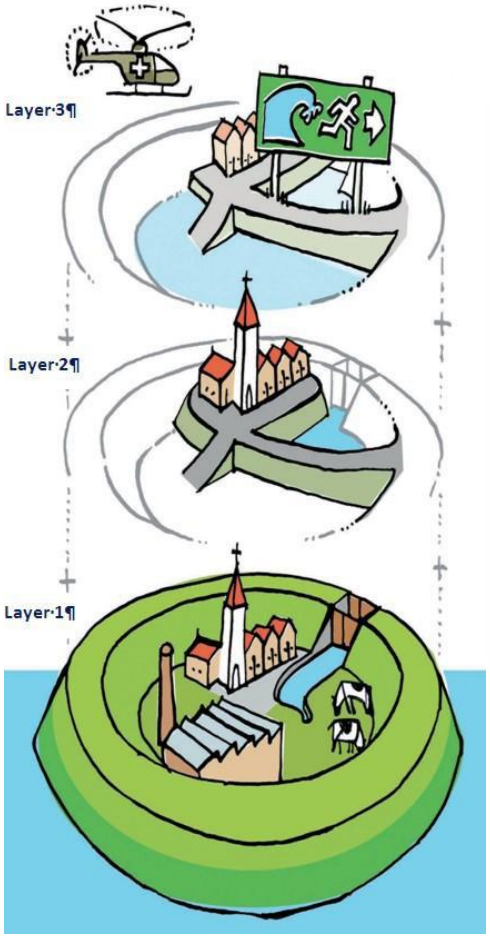
Protection

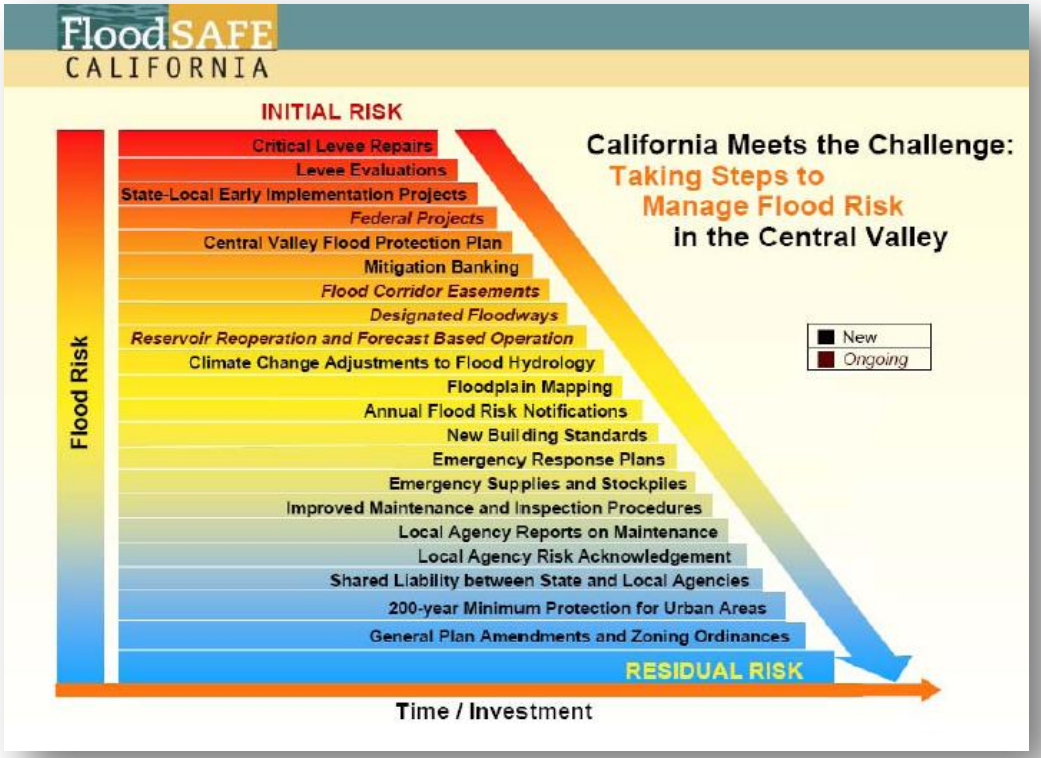


Created marsh in Virginia
Photo by K. Durhing

Recommendations

Multilayered Flood Protection





Use multiple protection layers to “buy down” risk and reduce the consequences if adaptation fails

Recommendations

Flexible adaptation plans

Chapter 5: The Thames Estuary 2100 Plan

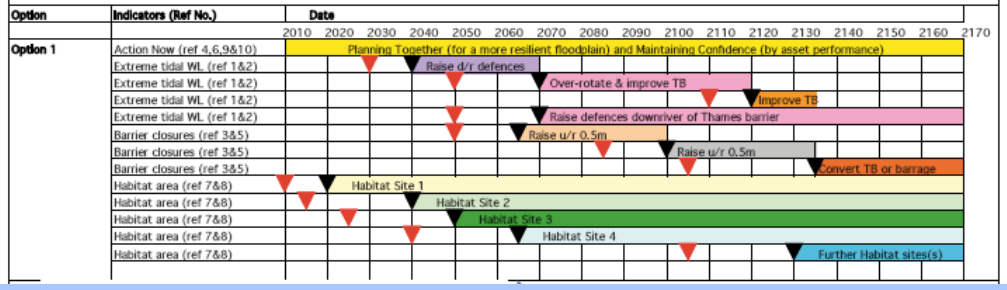
Monitor 10 indicators: MSL, peak surge tide level, conditions of flood defense structures, developed area, intertidal habitat, etc.

Table 5.3 TE2100 Plan Options 1 and 3 compared through the century

Action Now	Planning Together and Maintaining Confidence
Intervention 1	Habitat site No. 1
Intervention 2	Raise d/r TB defences
Intervention 3	Habitat site No. 2
Intervention 4	Habitat site No. 3
Intervention 5	Raise u/r TB by 0.5m
Intervention 6	Habitat site No. 4
Intervention 7	Impr TB + d/r defences
Intervention 8	Raise u/r TB by 0.5m
Intervention 9	Improve TB
Intervention 10	Further Habitat site(s)
Intervention 11	Barrier with locks/barrage

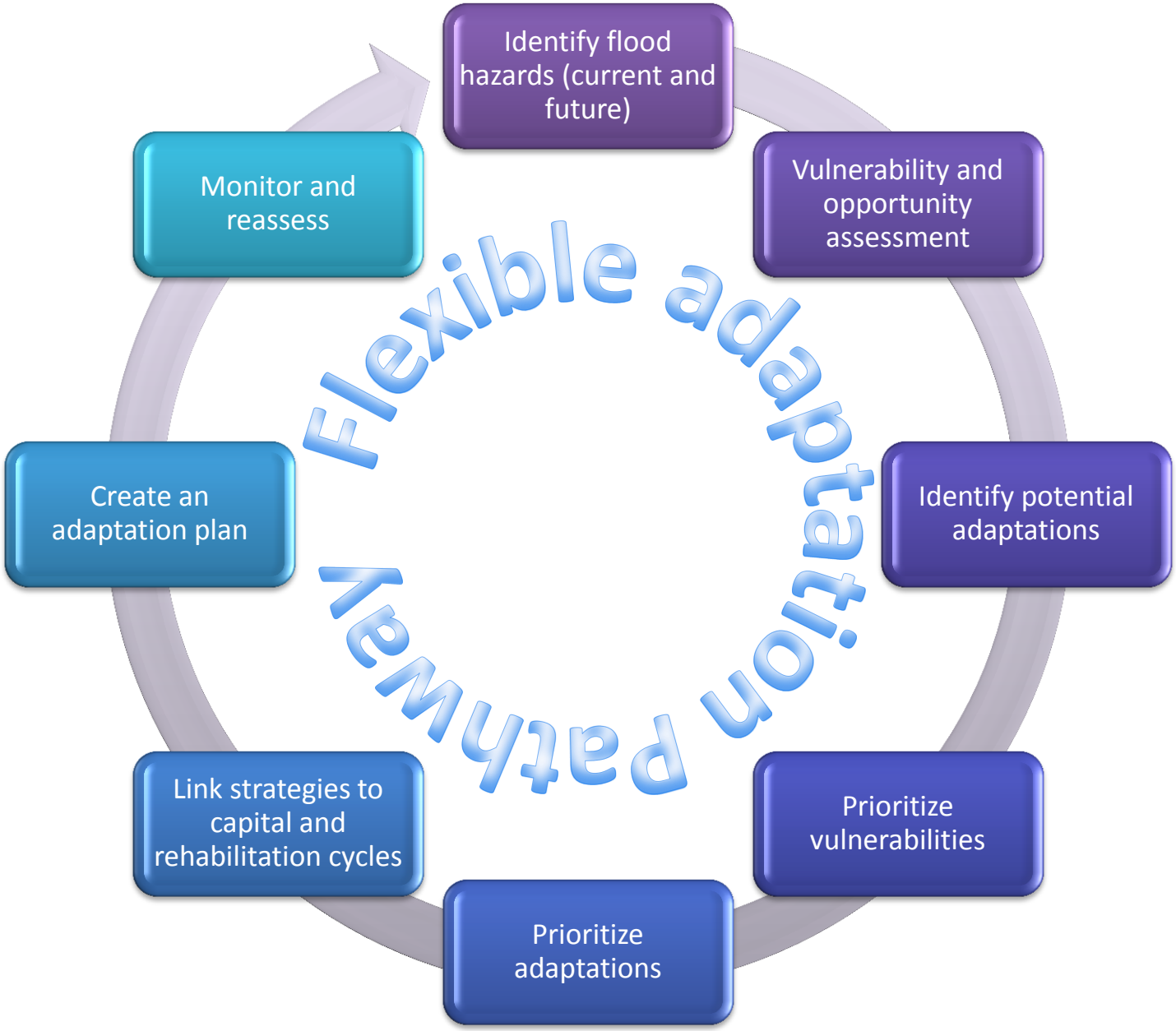
Main Assumptions
Policy P5 introduced in 2070
Government current climate change
Maximum 50 Barrier closures per year
0.2m forecasting uncertainty
1200ha habitat needed by 2100

Legend
Implementation point
Decision point
(Ref. No) as per "Ten Indicators for Change" Table
TB = Thames Barrier
d/r = Downriver
u/r = Upriver

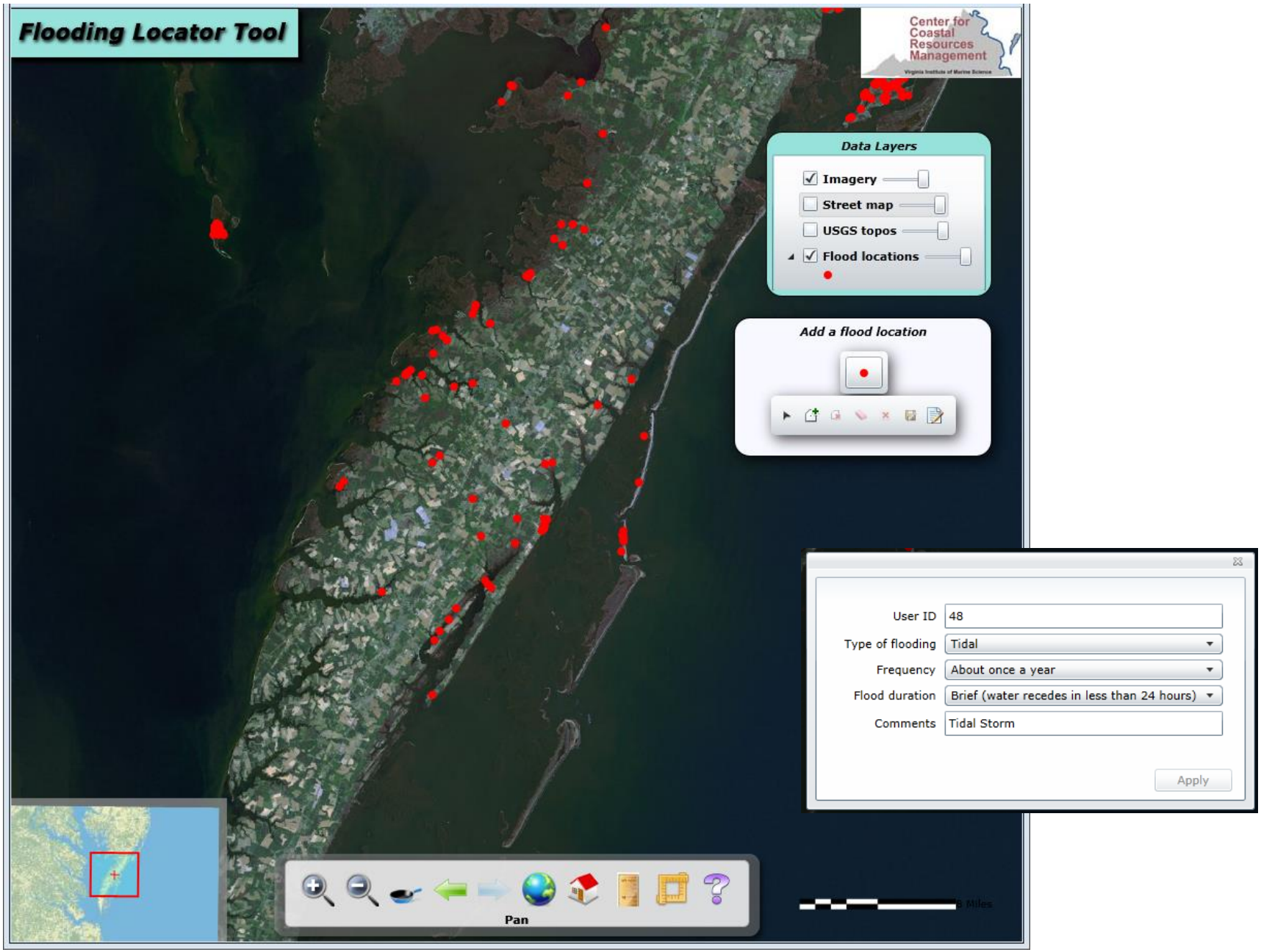


Adaptable because:

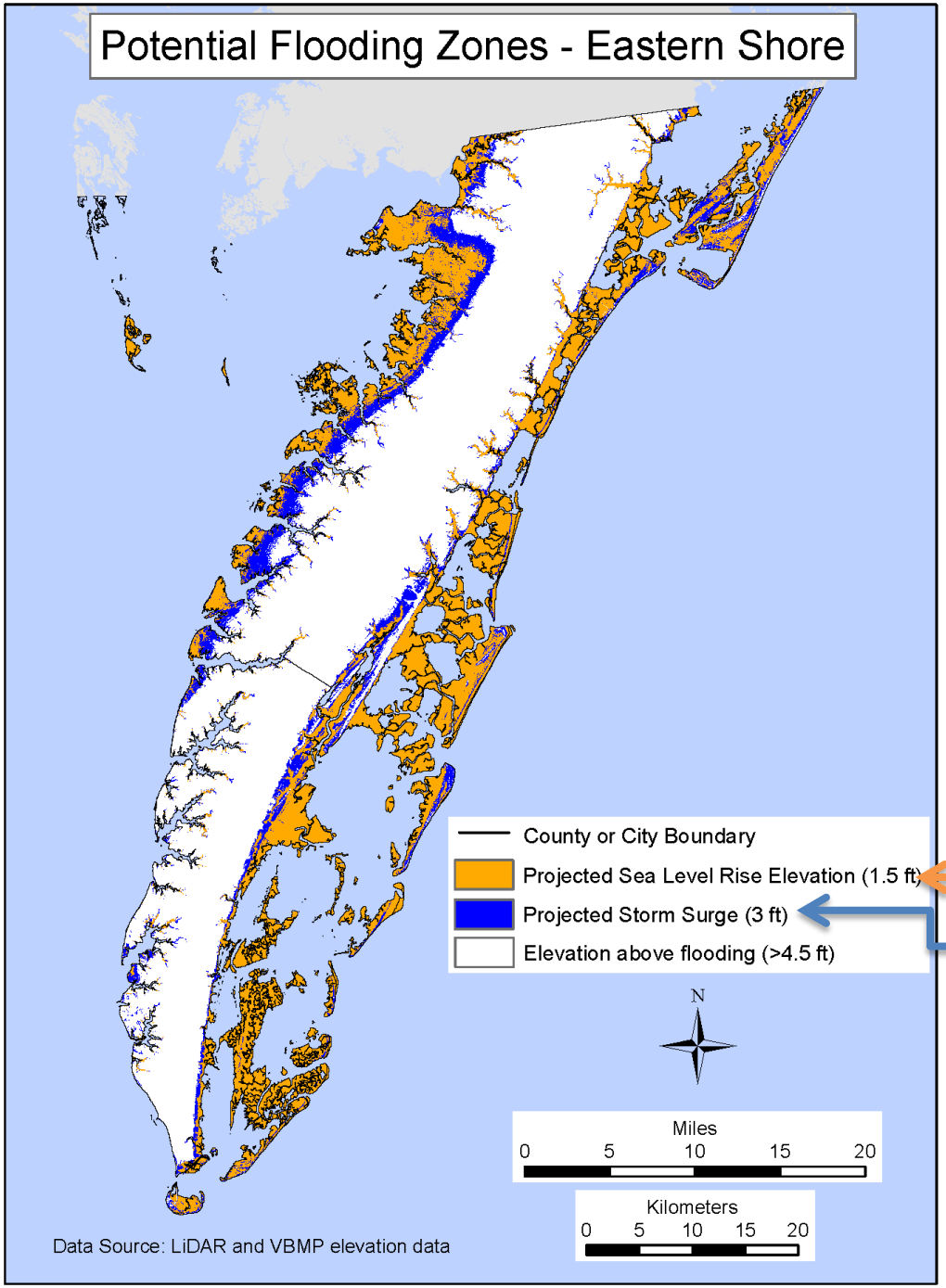
- Timing can be changed
- Can switch between options
- Structures designed to be upgraded
- Land planning includes potential future uses
- Considers new infrastructure planning



Adapted from: Climate Adaptation Guidebook for New York State, NYSERDA 2011



http://cmap.vims.edu/FloodLocations/FloodLocationsMappingSite

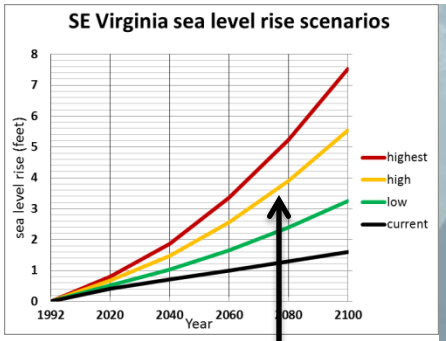


Likelihood of frequent flooding

	Accomack	Northampton
Total area (acres)	289,612	132,032
total area flooded	41%	46%
flooded area that is developed	2	1
Road miles flooded	362	44

Expected sometime 2040-2060

Typical size storm surge



Expected time frame

3.35 feet rise

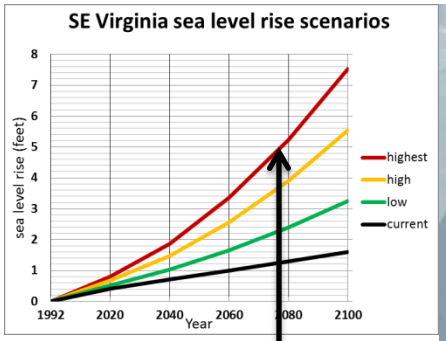
Agriculture impacts of storm surge / saltwater may require change in crops or landuse

Flooding in this area will require structure or retreat

Breakwaters still effective

Low development reduces costs of storm surge

Raise houses to accommodate storm surge?



Accelerated time frame

5.23 feet rise

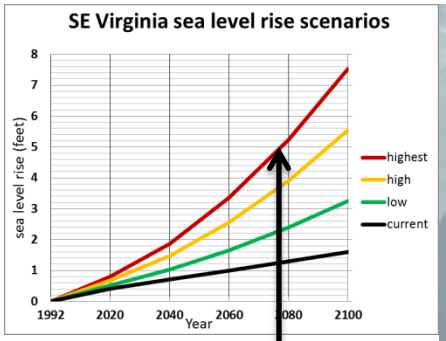
Retreat likely

Agriculture impacts of storm surge / saltwater may require change in crops or landuse

Low development reduces costs of storm surge

Floodwall necessary to protect town

Raise houses to accommodate storm surge & evacuate



Accelerated time frame

Shift in land use leads to development of agricultural lands

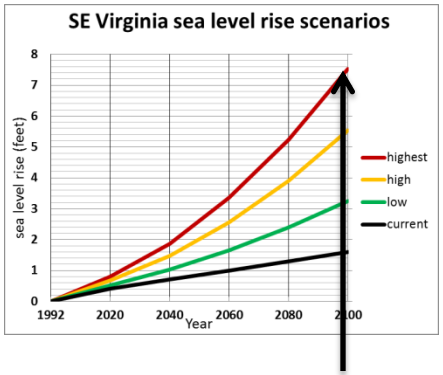
5.23 feet rise

Retreat likely

Storm surge barrier to protect new development

Floodwall necessary to protect town

Raise houses to accommodate storm surge & evacuate



Accelerated time frame

7.53 feet rise

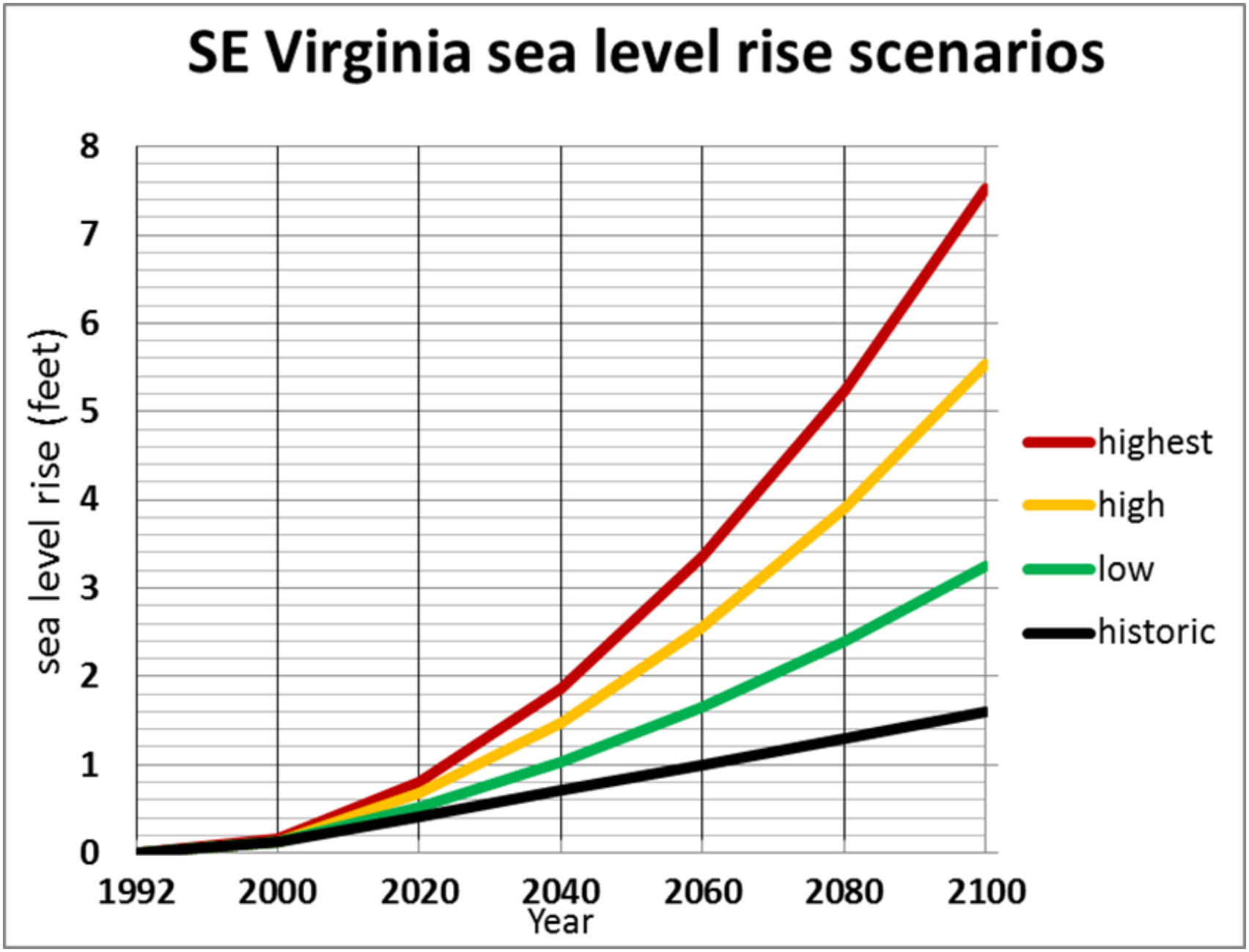
Retreat likely

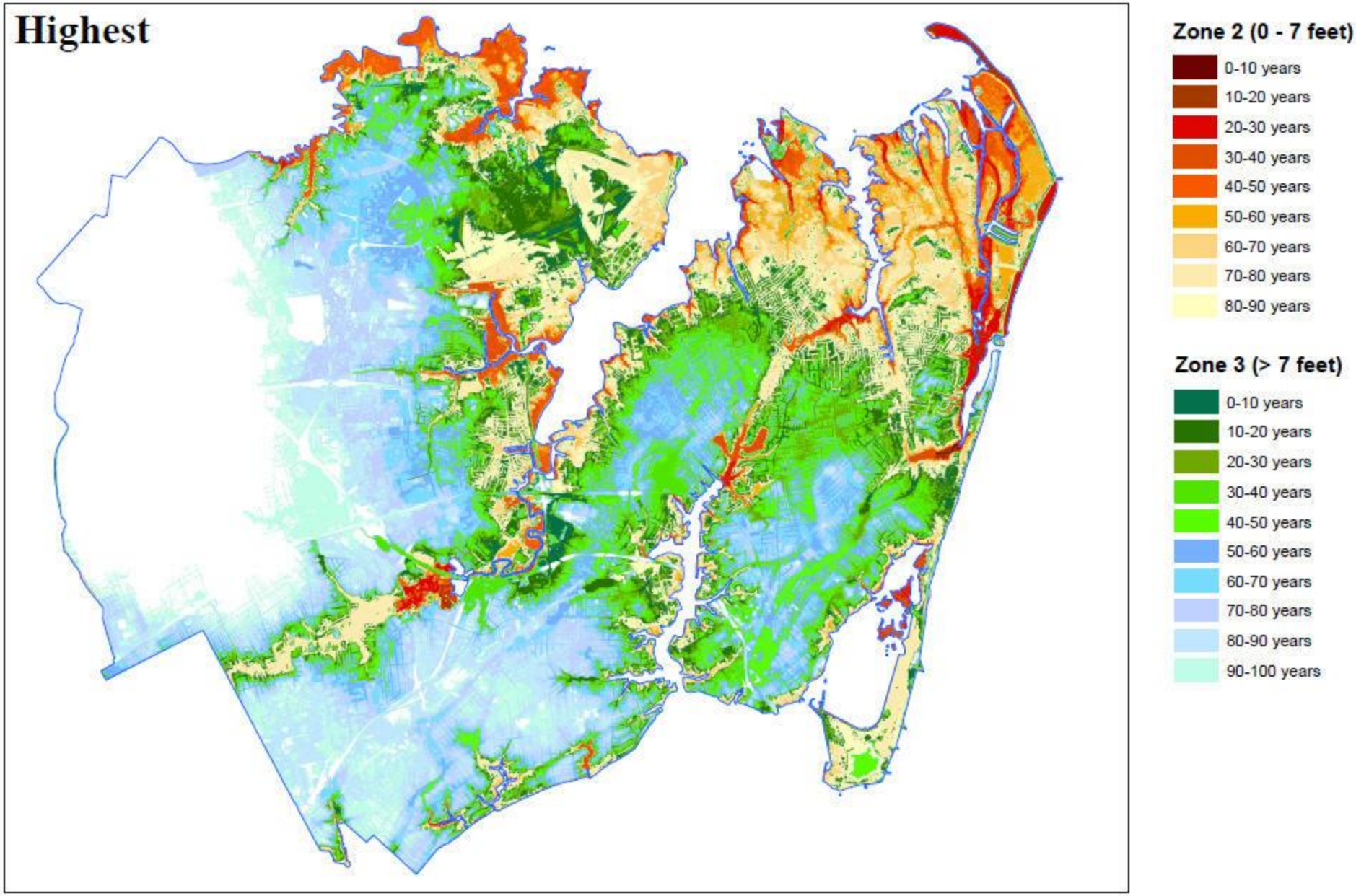
X

Retreat likely

Raise houses to accommodate storm surge & evacuate

SE Virginia sea level rise scenarios




Highest
Zone 2 (0 - 7 feet)
0-10 years
10-20 years
20-30 years
30-40 years
40-50 years
50-60 years
60-70 years
70-80 years
80-90 years
Zone 3 (> 7 feet)
0-10 years
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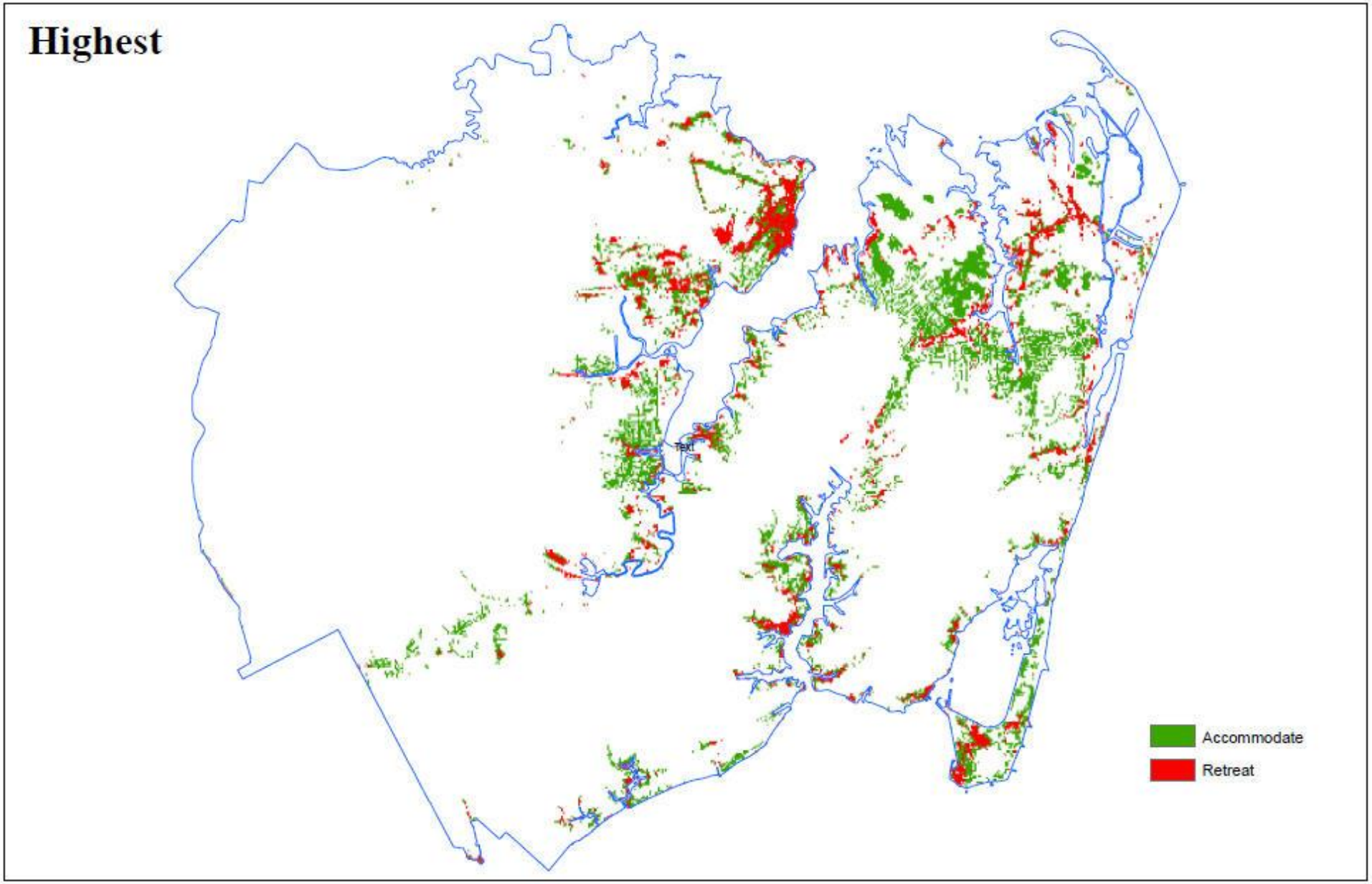
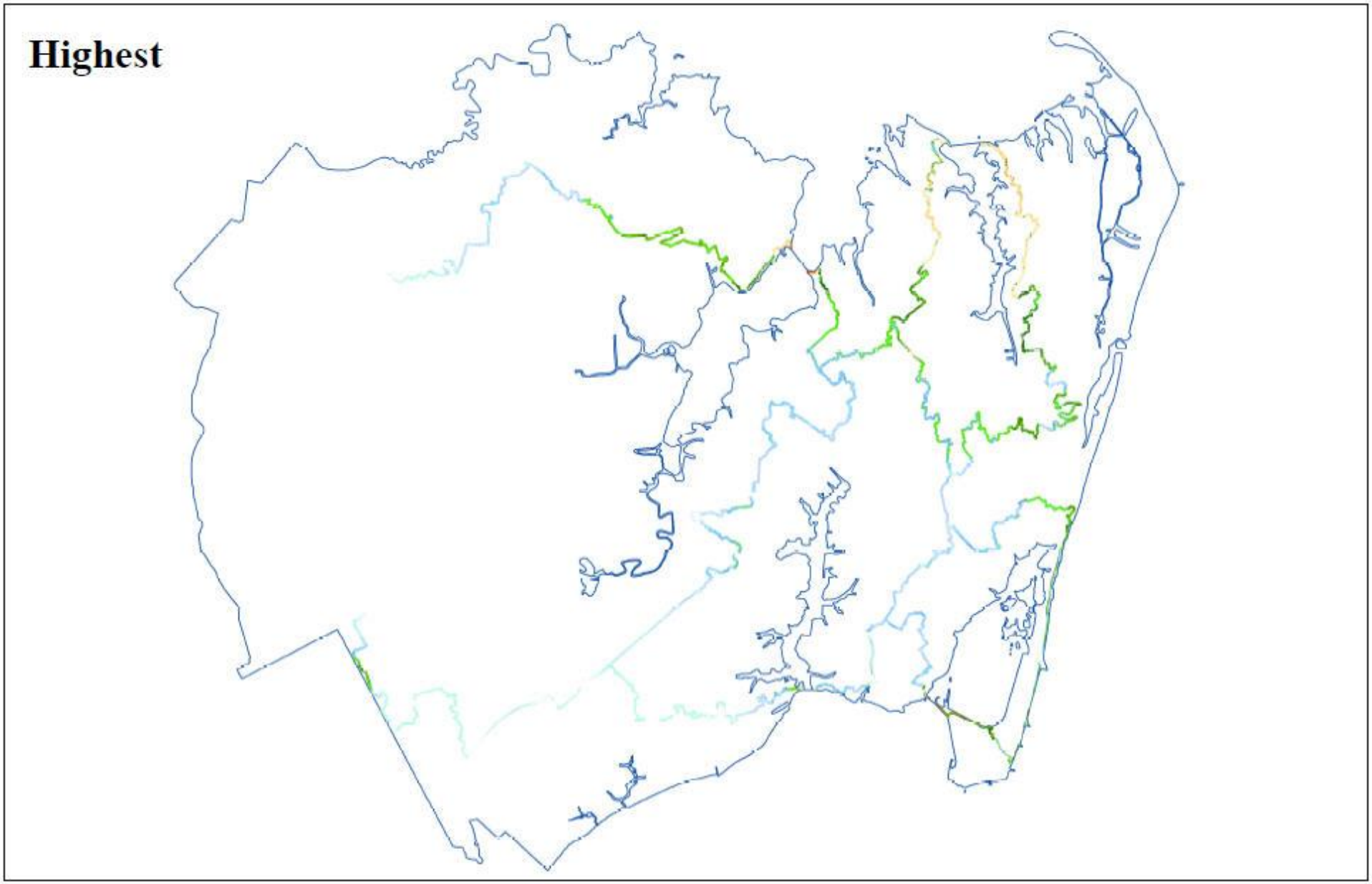

Highest
Accommodate
Retreat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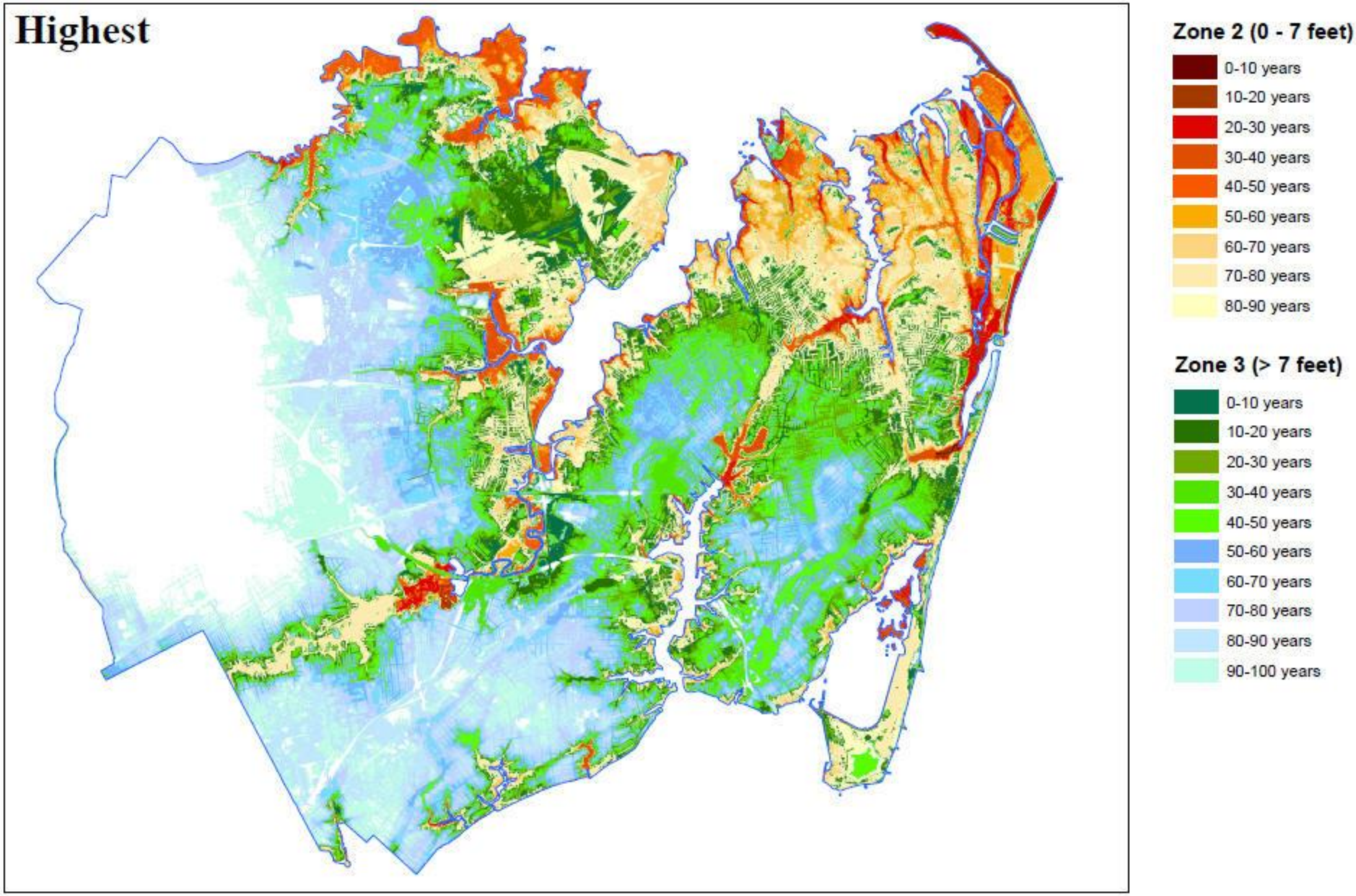
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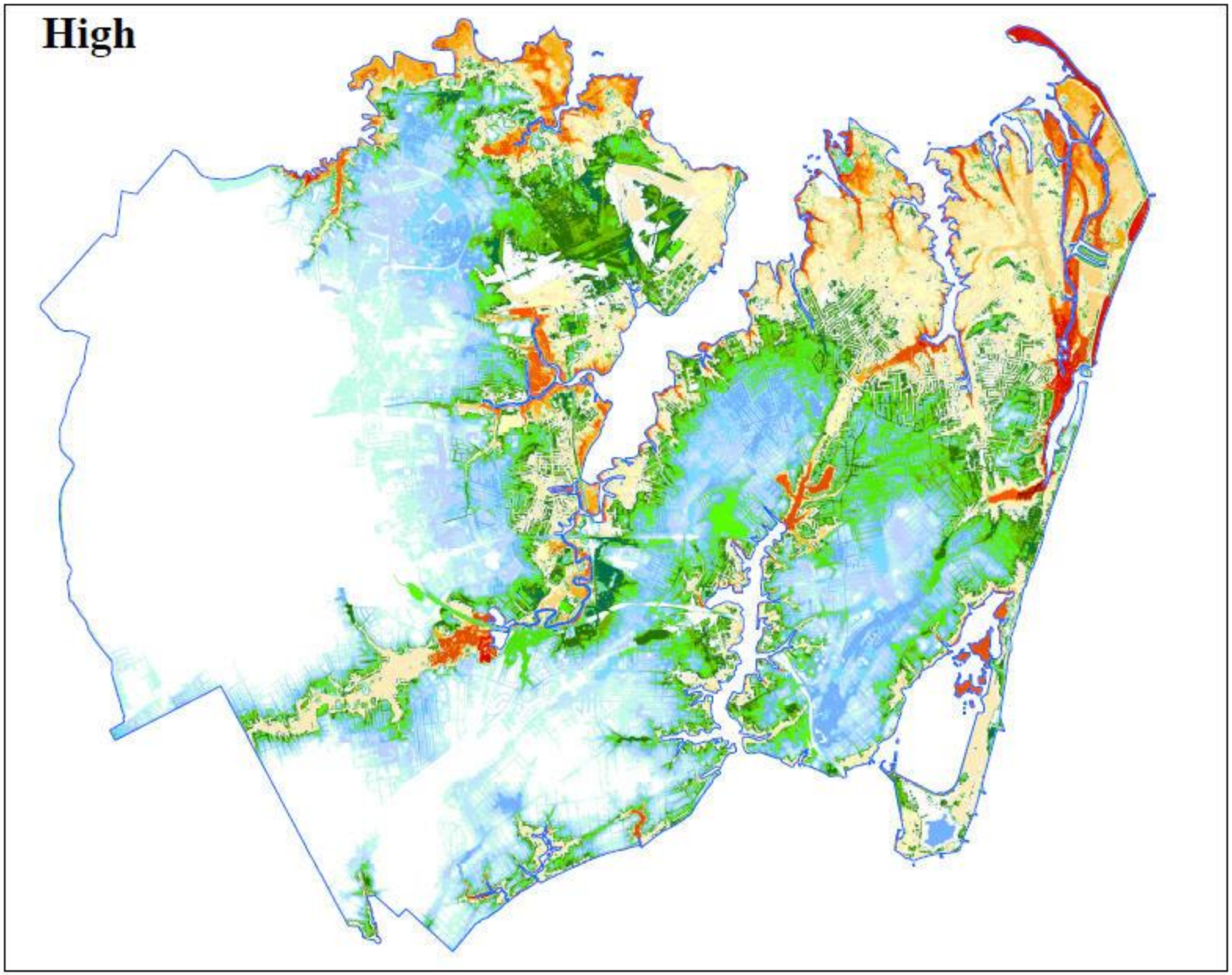
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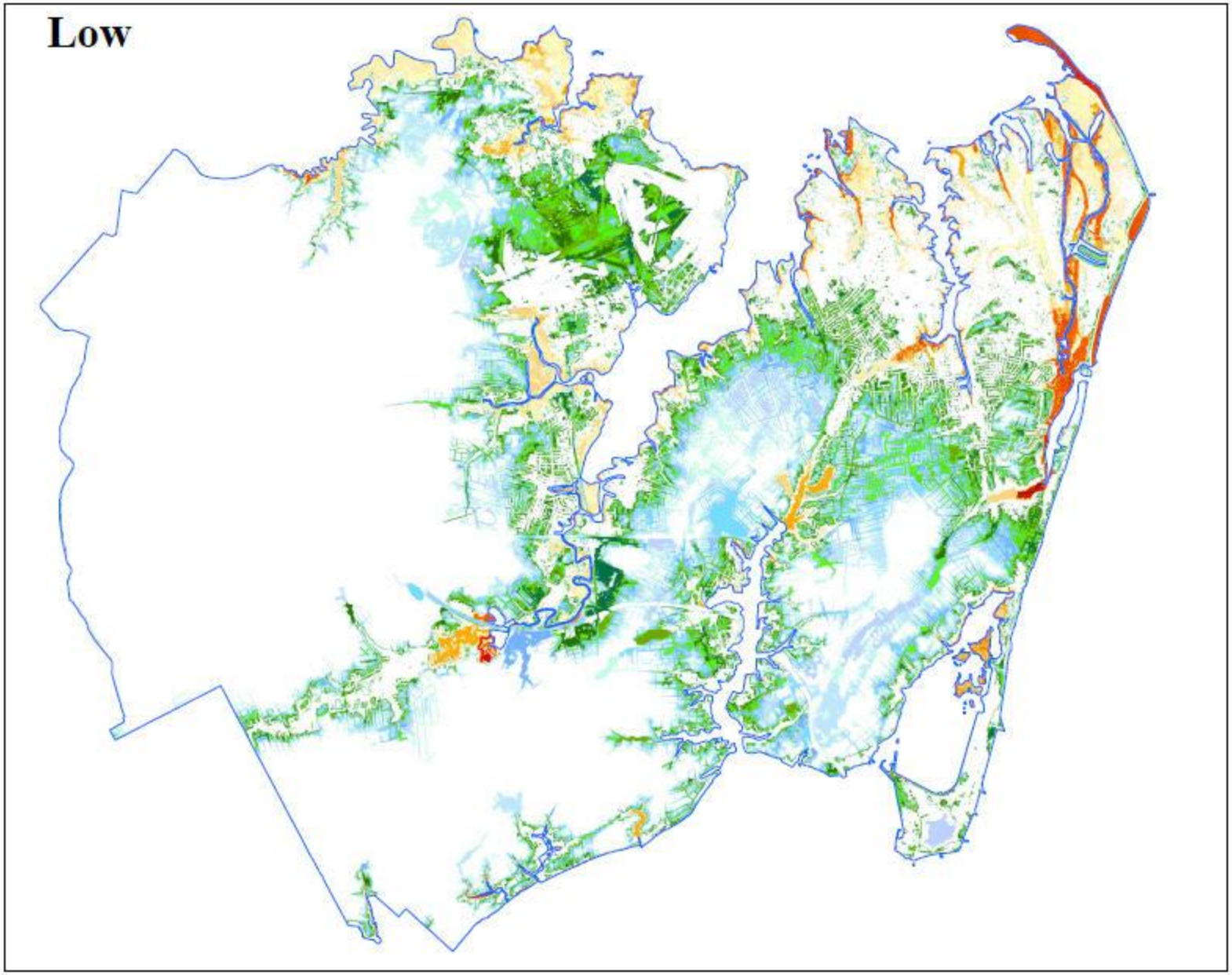
Low
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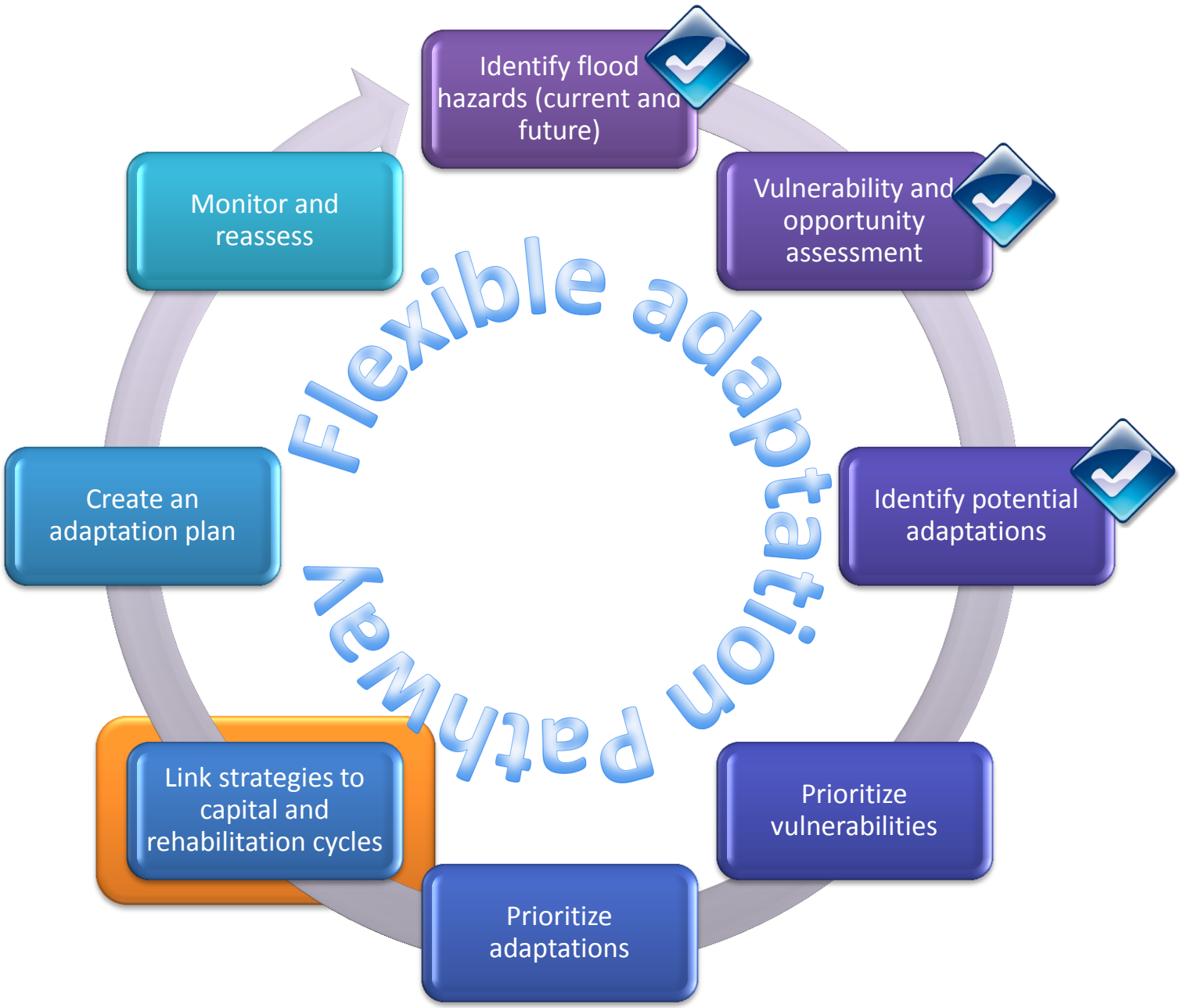

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Carl Hershner

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carl@vims.edu